[From the PROCEEDINGS OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE, Vol. XXXI, Montreal Meeting, August, 1882.]

THE ORGANIC COMPOUNDS IN THEIR RELATIONS TO LIFE. By LESTER F. WARD, of Washington, D. C.[1]

[ABSTRACT.]

ORGANIC compounds may be defined as "substances whose highly complex and very unstable molecules are composed of those of inorganic compounds or of organic compounds of lower organization, formed on the cooled surfaces of fully developed plants at life-supporting temperatures."

So far as the cosmical origin of the various substances composing the earth's crust, whether elemental or compound, is understood, it seems to have conformed to the following law: the molecules constituting each progressively more complex unit exhibit *increase of mass* accompanied by *decrease of stability.*

The artificial synthesis of organic compounds has obliterated the line formerly supposed to exist between the chemical constitution of inorganic and of organic compounds.

The properties of substances depend upon their molecular constitution: the more complex their constitution the more active their properties. Thus the properties of compounds are as a rule more active than those of elements, those of organic are more active than those of inorganic compounds, those of the alkaloids more active than those of the amyloids, and those of the albuminoids more active than those of the alkaloids. In the last case, however, the activity manifests itself in a different manner, viz., through rapid changes of internal structure including the phe-

---

[1] This paper was published in full in the American Naturalist, Vol. xvi (December, 1882) pp. 968–979.

nomena of isomerism; thus partially ceasing to be molecular and in a certain way affecting the mass.

These nitrogenous compounds themselves possess grades of complexity and instability, and thus we arrive in an ascending series at proteine and finally at protoplasm.

Protoplasm is a chemical substance whose relatively large molecules may have been compounded of those of the less complex albuminoids.

The activities manifested by protoplasm consist in actual alterations in the mass of the substance, which is the fundamental fact involved in the phenomena of life. Life is therefore essentially a property of protoplasm.

All the higher manifestations of life are reducible to protoplasmic activity, and the enlarged scale on which they operate is due to subsequent *organization*. A living being is only a quantity of organized protoplasm, and tissues are merely the framework and material machinery by means of which the life-substance is enabled to multiply effects.

CLASSIFICATION OF ORGANISMS. By LESTER F. WARD, of Washington, D. C.[1]

[ABSTRACT.]

THE terms *animal* and *vegetable* have proved wholly inadequate to express the distinctions which are found to exist among organisms. As popular terms they are useful, but as scientific terms they have already led to much fruitless discussion.

The fundamental distinction in biology should be drawn between those organisms which are capable of assimilating chemical or inorganic matter, and those which depend entirely upon the appropriation of matter already so manufactured. We would thus have two classes of organisms, viz., first, assimilators, tissue manufacturers, or *autogens;* and second, *parasites.*

The first of these classes might be subdivided into three groups: 1. Those that manufacture protoplasm only and con-

---

[1] This paper was condensed from the writer's work "Dynamic Sociology" (New York, D. Appleton & Co., 1883, Vol. i, pp. 347–355), published since the Montreal Meeting.

sist entirely of that substance. 2. Those that manufacture both protoplasm and also some form of protective integument or framework. 3. Those which decompose carbonic dioxide and employ the carbon thus liberated as the strengthening material of their tissues, viz., plants proper.

The second class is also divisible into three groups: 1. Those which appropriate matters already manufactured by organisms of the first class (or, as in the case of lichens, take them at third hand from organisms of the same class), but which are not only fixed like plants but are of low organization and simple cellular structure. 2. True parasitic plants, whose organization plainly indicates that they have descended from chlorophyl-bearing plants, of which they are degraded types. 3. Animals proper, which live on the substance manfactured by the first class of organisms, either by taking it directly from plants, or by preying on others of their own group which have derived their sustenance from plants.

[SALEM PRESS, July, 1883.]